920522-95345

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE THE APPLICATION OF	) Examiner: Steven Holton
Tanghe et al.	) Group Art Unit: 2629
SERIAL NO. 10/743,970	) Customer No.: 23644
FILED: December 23, 2003	) Confirmation No.: 9404
FOR: Control System for a Tiled Large-Screen Emissive Display	)

BRIEF ON APPEAL

Honorable Director of Patents and Trademarks
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Appeal is from the Examiner's final Office Action of December 04, 2008.

An appropriate response, with extension of time, was filed with the Patent and Trademark Office on April 6, 2009, leading to the Examiner's Advisory Action of June 4, 2009 maintaining the rejections of the application. An appropriate Notice of Appeal was filed with the Patent and Trademark Office on June 3, 2009 with the necessary further extension of time.

(i) Real Party in Interest

This application is assigned to Barco N.V. which is the real party in interest.

(ii) Related Appeals and Interferences

There are no known prior and pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the present appeal.

(iii) Status of Claims

This application was filed with claims 1-25 and during prosecution claim 26 was added. Claims 19 and 21-22 were cancelled and claims 1, 11, 15, 18, 23 and 24 amended.

Claims 1-18, 20 and 23-26 are finally rejected.

It is the rejection of claims 1-18, 20 and 23-26 that is appealed, and the appealed claims are set forth in the Claims Appendix.

(iv) Status of Amendments

No claim amendments were made following the final Office Action. However, a response, arguing the impropriety of the final Office Action, was filed with the Patent and Trademark Office on April 6, 2009, leading to an Advisory Action of May 4, 2009 in which the examiner maintained the rejections set forth in the final Office Action.

(v) Summary of Claimed Subject Matter

There are two independent claims in the application, claims 1 and 24.

A. Claim 1

Claim 1 is directed to a method for controlling a tiled large screen emissive display (page 3, lines 5-7). In general, the large screen display has a modular architecture with a hierarchical structure of different levels. According to an example, given in the paragraph bridging pages 10 and 11 of the specification and illustrated in Fig. 1, the lowest level of the structure comprises the emissive devices (pixels), which are grouped into modules; the modules are grouped into tiles and a number of tiles constitute a sub-display, the sub-displays constituting the large screen display itself. Claim 1 describes a display having a structure with at least three levels: the display itself and a number of subdivisions, with each of these subdivisions comprising a number of emissive devices (from page 10, line 25 to page 11, line 3). The emissive devices are calibrated to an optimal target value by a setting of these devices and, subsequently, the subdivisions are calibrated (page 20, lines 18-22). The method includes an initial and a periodic calibration (from page 24, line 24 to page 25, line 23).

B. Claim 24

Independent apparatus claim 24 is similar to independent method claim 1. As a result, the summary of the claimed subject matter of independent claim 24 is the same as claim 1 above, and reference is made to the immediately preceding paragraph for the description of claim 24 as well.

(vi) Grounds of Rejection to be reviewed on Appeal

There are two grounds of rejection of the claims of this application:

A. Ground 1 (Claims 1-10, 15-18, 20 and 23-26)

Claims 1-10, 15-18, 20 and 23-26 are rejected under 35 USC § 103(a) as being unpatentable over Greene et al. (US 6,020,868), in view of Someya (US 5,396,257), and further in view of Cok et al. (US 7,161,566).

B. Ground 2 (Claims 11-14)

Claims 11-14 presently stand rejected under 35 USC § 103(a) as being unpatentable over Greene in view of Someya and further in view of Miller et al. (US 7,184,067).

(vii) Argument

A. Ground 1 (Claims 1-10, 15-18, 20 and 23-26).

The Examiner has rejected the claims 1-10, 15-18, 20 and 23-26 under 35 USC § 103(a) as being unpatentable over Greene et al. in view of Someya and further in view of Cok et al.

Independent claim 1 of the present invention, which is also representative of independent claim 24, reads as follows:

1. A method for controlling a tiled large-screen emissive display (100), said emissive display (100) comprising at least a plurality of first subdivisions, each of said first subdivisions comprising a plurality of emissive devices, said method comprising:

for each of the first subdivisions, setting the emissive devices so that each of said first subdivisions is optimized with respect to a first subdivision target value for that first subdivision, and

after setting the emissive devices,

for the emissive display (100), setting the first subdivisions so that said emissive display is optimized with respect to an emissive display target value for said emissive display (100)

wherein setting the emissive devices and setting the first subdivisions includes initial and periodic calibration.

With regard to claim 1 (and 24) and in relation with Greene, the Examiner states:

"Regarding claims 1 and 24, which are drawn to a method of operation and associated display device, Greene discloses a tiled display with flat panel displays making up the tiles (Fig. 2, col. 4, lines 48-52). Green discloses the flat panel displays are known using many different types of technologies including liquid crystal displays, plasma displays, and electroluminescent displays (col. 1, lines 17-24). Greene further discusses a method of matching the visual output of the flat panel display device using correction data stored in memory devices for application to signals to be displayed.
However, Greene does not expressly disclose a method of matching color of a tiled display including "for each of the first subdivisions, setting the emissive devices so that each of said first subdivisions is optimized with respect to a first subdivision target value for that first subdivision, and after setting the emissive devices, for the emissive display, setting the first subdivision so that said emissive display is optimized with respect to an emissive display target value for said emissive display." Also, Greene does not expressly disclose initial and periodic calibrations of the display system." (Final action, page 4 and beginning of page 5)

Applicant is of the opinion that this statement is incomplete. Greene discloses a tiled, flat-panel display having color-matching between the tiles. This matching is accomplished by a direct transformation of video data through values stored in tables. Input data are transformed into transformed values, based on the value of the input data and the spatial location of the destination of this data (col. 3, lines 6-10).

However, the following differences exist between the method according to claim 1 and the apparatus, disclosed in Greene:

- Greene does not disclose a setting of emissive devices or of first subdivisions. "Setting" means that one or more parameters of the emissive device (e.g. in the

case of OLED's: the pre-charge time) is set to a given value. In Greene, the video signals (input data) are transformed into new values.

- Greene does not contain any optimization with respect to any target value; video data are transformed using values stored in tables, without any optimization process.
- Greene does not disclose a target value at any level of the tiled display; Greene tries to solve the problem of the "unacceptable, high-gradient condition", i.e. large changes in luminance or chromaticity between one region of the display, but Greene accepts the "low-gradient"-rule, i.e. small gradual changes in luminance or chromaticity (from col. 1, line 63 to col. 2, line 4 and col. 2, lines 36-41).
- Greene does not disclose an initial and a periodic calibration.

Regarding claim 1 and in relation with Someya, the Examiner continues:
"*Someya discloses a method of matching the output of a tiled display device in which each display device is set to optimize the display of the individual display device and then matching the corrected individual display devices to completely match the tiled display device (col. 4, lines 37-59).*
At the time of invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Greene and Someya to produce a method of controlling a tiled display device for correcting the output of the display device. The tiled display device of Greene which uses a flat panel display could be done using any of the well- known types of flat panel display such as an electroluminescent display. Such an electroluminescent display devices is comprised of individual pixels and sub-pixels for emitting light to make up a displayed image. The method of tile display matching described by Someya could be applied to the electroluminescent tiled display of Greene so that first each electroluminescent display would be corrected and then multiple electroluminescent displays would be matched to each other. The motivation would be to produce a tiled display device with reduced luminance shading and color shading between the plurality of display units (Someya; col. 2, lines 39-42).
However, the combination of Greene and Someya do not expressly disclose

initial and periodic calibration of the display system." (pages 4-5 of Examiner's final Office Action of December 04, 2008)

Applicant respectfully disagrees.

Firstly, Someya does not disclose a display having "emissive devices" in the meaning of the present invention. It is clear from the specification that by "emissive devices" is meant "pixels" (see the specification, page 5, lines 13-14: "*Although in the detailed description an illustration is given for controlling the tiled large-screen emissive display on three levels, i.e. devices - also called pixels -, modules and tiles,....*").

The multiscreen display apparatus of Someya relates to a CRT display consisting of four cores (Fig. 1 and 3, the displays 6a, 6b, 6c and 6d). Each of the cores is further subdivided in a number of blocks (col. 5, lines 13-16), which, in Someya, constitute the lowest level of the display screen. However, such a block comprises many pixels and is thus not equivalent to the claimed emissive devices of the present invention.

Secondly, the basic elements of the display according to the invention, are emissive devices which are "set" (LEDs are set to an operating point by a precharge or a current e.g. in order to compensate for aging) and the setting is independent of the applied video signals. In Someya, the basic element is a block, which is part of a CRT. "Setting" of such a block is not possible and for this reason the correction of, for example, luminance shading in Someya is performed by applying a correction signal to the video signals. Indeed, one of the problems Someya wants to solve is to eliminate the luminance shading between the central part of a CRT-screen and peripheral part of that screen (Col. 5, lines 9-17). Therefore, each screen is divided in a number of blocks and a LUT (Look up Table) is associated with each block (Col. 5, line 18). Each LUT comprises correction values for a plurality of luminance levels (col. 5, lines 43-

50). The input video signal (fig. 3, 10) is stored in a frame memory (3), wherefrom it is read-out and inputted to a data converter (4a, 4b, 4c and 4d). The data converter converts the video signal into data corrected in luminance shading for each of the cores. In Someya, the luminance shading is thus not done by "setting" the blocks, but by correcting the video signals.

Regarding the "setting" of emissive devices, it appears appropriate to discuss also the argument of the Examiner on page 3 of the final Office Action. The argument is as follows (applicant is of the opinion that there is a clerical error in the beginning of this argumentation: "because the claimed invention is drawn to optimization of parameters of the display device" should rather read:" because the claimed invention is drawn to setting the emissive devices"):
"*On pages 8 and 9 of the remarks, the Applicant has argued that the claimed invention is distinct from Greene and Someya because the claimed invention is drawn to optimization of parameters of the display device. The Examiner finds this argument non-persuasive based on the scope of the dependent claims. Later claims disclose adjustment of the display device parameters based on measurements of aging, environmental parameters and other issues (claims 11 and 13 for example). Further, the disclosure clearly states that some of the adjustments based on aging and other factors will involve the changing of the gamma curves, contrast, and brightness (paragraph 100). Such adjustments do not set a parameter of the display device but would directly adjust the image data being displayed to adjust the brightness of the image displayed. Greene and Someya disclose adjusting the image data to control brightness and contrast of the final image. Therefore, the references do disclose setting an emissive display to a target value for operation of the display device. These target values are directly used to adjust the gamma, brightness, or contrast of the final image and are the same as the target values described by the Applicant which are used to adjust the brightness, gamma curves, and contrast of the final image output.*"

And in the Advisory Action, the Examiner argues:

"*It is common that the image data of an emissive display be encoded to contain the brightness and gamma correction information as part of the encoded image data. The image data directs a display device to emit light at a specific location for a specific duration to produce a pixel of light having a predetermined brightness (luminance). Gamma correction is also commonly included in the encoding of the image data that is transmitted to the emissive pixels. Standard broadcast encodings such as PAL and NTSB provide display content of brightness (luminance) and gamma correction as part of the image data. The adjustment of image data to change the luminance (brightness) as described by Someya is simultaneously adjusting the image content because the image data stores all of the necessary image content to produce a correct image. The Examiner finds that adjusting image the brightness of a individual pixel, adjusting the gamma correction curve used by a entire display device, or similar adjustments to contrast of a display device will result in adjustments of the image data that is used by the display to produce the desired image. This is due to the encoding of brightness and gamma values as a part of the image data used by individual pixels for operation.*"

The examiner is correct when he says that the present application clearly states that some of the adjustments based on aging and other factors will involve the changing of gamma curves, contrast and brightness. But there is, apparently, certain confusion. Indeed, in the application, several kinds of "adjustments" are disclosed, among them the "adjustments" derived during the calibrating procedure (e.g. Fig. 5, step 422) but also other adjustments, decided during the use of the display (Fig. 5 continued, from step 430 onwards).

The subject of claim 1 is the calibration procedure as described in the specification from page 24, line 24 to page 25, line 23 and illustrated in step 422 of Fig. 5. During this calibration procedure, emissive devices are set with respect to a target value and as set forth in claims 11 and 13, an environmental

parameter may be taken into account for determining this target value (see also the specification, page 19, line 20: "running pre-charge control algorithms for OLED modules 120").

In the paragraph bridging pages 21 and 22 however, another adjustment is discussed, **which is not the subject of the claim under review**. This adjustment takes the environment (e.g. inside or outside projection, nature of displayed image, etc.) into account for adapting gamma, contrast, brightness and so increase lifetime. A detailed description of this adjustment can be found on pages 39 to 46. As an example, the gamma is adjusted by selecting a gamma curve, used for converting the digitized RGB data (page 40, lines 27-29).

The adjustment, explained in this paragraph, is thus different from the "adjustment" during the calibrating process of claim 1, although in both adjustments environmental parameters may be taken into account.

Thirdly, Someya does not disclose any "optimization" of the settings of the emissive devices with respect to a target value.

The arguments of the Examiner in this respect are further clarified in the paragraph bridging pages 2 and 3 of the final Office Action:
"*The Examiner finds the arguments regarding optimization to be non-persuasive. It would be a matter of design choice to select values of operating parameters to optimize a device for desired operation. Depending on the desired operation the parameters of a device would be selected to meet an optimized performance. Such selection of parameter values is well within the ability of one of ordinary skill in the art and is not inventive.*"

In the Advisory Action, the Examiner argues as follows:
"*Regarding the discussion of the definition of optimization. The Examine agrees that the process of optimization is not merely a manner of picking values.*

Calculations are performed to determine values that will produce the desired outcome. In many display devices calculations are performed in a laboratory setting for a single generic display and results are then encoded into permanent storage devices placed in mass produced display devices. The mass produced device then 'optimizes' its performance by reading the predetermined values from storage. This practice removes the need of including a processor in each device to calculate the optimized solutions and is used as a money saving technique. In the case of the prior art, Someya sets a desired luminance (1000/0) and then calculates how to adjust each display core so that all blocks of the display achieve a corrected output without luminance shading at 100%. This calculation process sets all of the output blocks to operation values to reach a desired target. This is equivalent to the process of optimization descried within the Applicant's specification (paragraphs 92-95)."

The paragraphs from page 20, line 7 to page 21, line 4 of the specification relate to the successive calibration at the different levels of the display, mentioning the optimization in a more general manner. A more precise explanation of the optimization during calibration can be found on page 24, lines 27-30 of the specification:
"*Taking into account the target brightness and color coordinates the optimal result opt(x,y,Y), i.e. closest to the target, that can be realized with all or substantially all pixels in a module is determined.*"

The optimization comprises thus two steps:

- a determination of a target (possibly taking into account an environmental parameter);
- a determination of a value, which is closest to the target value and which can be realized by all or substantially all of the pixels.

The "optimization" is thus more than a "*design choice to select values of operating parameters*" . It is even more than "*to determine values that will*

produce the desired outcome", because it is not sure that all elements (in the claim the emissive devices) can achieve the desired outcome.
Attention is also drawn to the typical mathematical meaning of the word "optimization" as set forth in "Webster's Encyclopedic Unabridged Dictionary". According to Webster's, optimization is: "a mathematical technique for finding a maximum or minimum value of a function of several variables subject to a set of constraints, as linear programming or system analysis". An optimization process is thus not equivalent to a pure selection of values, but rather is a mathematical determination or calculation of such values. In the present invention, the determination is based on the possible brightness and color coordinates, which can be realized by e.g. the emissive devices but other constraints like temperature, humidity may also be taken into account.

In Someya, a target value is determined (e.g. 100% luminance) and the necessary correction to reach this target value in each block is determined, without taking into account whether the block concerned can reach this target or not (Col. 5, lines 18-23). This process is than repeated for equalizing the luminance between the cores. Optimization is thus not disclosed in Someya.

Initial and periodic calibration is also not disclosed by Someya, as already admitted by the examiner.

Regarding claim 1 and in relation with document Cok, the Examiner continues:
"*Cok discloses a method of adjusting an emissive display system using both an initial calibration of the display device (Fig. 3, steps 30-35) and performing periodic calibrations (Fig. 3, steps 44-56; col. 6, lines 16-21) after the initial calibration of the display device.*" (final Office Action, paragraph bridging pages 5 and 6).

Applicant agrees with this statement about the teachings in Cok.

As a general conclusion, the following is set forth in the final Office Action:
"*At time of invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Greene, Someya, and Cok. The calibration and data matching of the Greene and Someya systems could be combined with the periodic calibration method of Cok. The rationale would be that aging of emissive elements or other operation parameters known to affect the display device could be taken into consideration as part of the calibration of the display device. Thus, it would have been obvious to combine the teachings of Greene, Someya, and Cok to produce a method and device as described in claims 1 and 24.*"

Applicant respectfully disagrees.

Indeed, as shown above, the following features of claim 1 are not disclosed in any of the cited references (or a combination of their teachings):

- setting of emissive devices or of first subdivisions;
- optimization of the first subdivisions or of the emissive display with respect to a target value.

Thus, claim 1 is clearly non-obvious in view of the prior art.

In view of the arguments above and claim 1 being also representative of apparatus claim 24, independent claims 1 and 24 are submitted to be in condition for allowance.

Claims 2-10, 15-18, 20, 23 and 25-26 are dependent claims, depending on independent claims 1 and 24, respectively. Consequently, claims 2-10, 15-18, 20, 23 and 25-26 also are allowable, at least by virtue of their dependence on allowable claims.

B. Ground 2 (Claims 11-14)

The Examiner has rejected claims 11-14 under 35 USC § 103(a) as being unpatentable over Greene in view of Someya and further in view of Miller et al. (US 7,184,067).

Claims 11-14 depending on allowable claim 1. Claims 11-14 are thus also allowable.

CONCLUSION

The above has demonstrated that the rejection of claims 1-18, 20 and 23-26 is in error and that the Examiner should be reversed. Such action is therefore solicited.

August 10, 2009

Respectfully submitted,

William M. Lee

William M. Lee, Jr.
Registration No. 26935
Barnes & Thornburg LLP
P.O. Box 2786
Chicago, Illinois 60690-2786
(312) 214-4800
(312) 759-5646 – Fax

Claims Appendix

1. A method for controlling a tiled large-screen emissive display (100), said emissive display (100) comprising at least a plurality of first subdivisions, each of said first subdivisions comprising a plurality of emissive devices, said method comprising:
for each of the first subdivisions, setting the emissive devices so that each of said first subdivisions is optimized with respect to a first subdivision target value for that first subdivision, and
after setting the emissive devices,
for the emissive display (100), setting the first subdivisions so that said emissive display is optimized with respect to an emissive display target value for said emissive display (100)
wherein setting the emissive devices and setting the first subdivisions includes initial and periodic calibration.

2. A method according to claim 1, said plurality of first subdivisions being grouped into a plurality of second subdivisions, wherein said setting the first subdivisions is performed by
for each of the second subdivisions, setting the first subdivisions so that each of said second subdivision is optimized with respect to a second subdivision target value for that second subdivision, and
thereafter
for the emissive display (100), setting the second subdivisions so that the emissive display is optimized with respect to an emissive display target value for said emissive display (100)

3. A method according to claim 2, said plurality of second subdivisions being grouped into a plurality of further subdivisions, wherein said setting the second subdivisions is performed by

for each further subdivision, setting the second subdivisions so that the further subdivision is optimized with respect to a further subdivision target value for said further subdivision, and after setting said second subdivisions

for the emissive display (100), setting the further subdivisions so that the emissive display is optimized with respect to an emissive display target value for said emissive display (100)

4. A method according to claim 1, wherein said first subdivision is an emissive display tile (118).

5. A method according to claim 2, wherein said first subdivision is an emissive display module (120) and said second subdivision is a display tile (118).

6. A method according to claim 3, wherein said further subdivision is an emissive display supertile.

7. The method according to claim 1, wherein for each first subdivision, setting the emissive devices comprises setting the emissive devices so that they are within 10%, preferably within 5% and most preferably within 0.8% of the first subdivision target value of that first subdivision.

8. The method according to claim 1, wherein for said emissive display (100), setting the first subdivisions comprises setting the first subdivisions so that they are within 10%, preferably within 5% and most preferably within 0.8% of the emissive display target value of that emissive display (100).

9. The method according to claim 2, wherein setting the first subdivisions comprises setting the first subdivisions so that they are within 10%, preferably within 5% and most preferably within 0.8% of the second subdivision target value of that second subdivision and

wherein setting the second subdivisions comprises setting the second subdivisions so that they are within 10%, preferably within 5% and most preferably within 0.8% of the emissive display target value of the emissive display (100).

10. The method according to claim 3, wherein setting the first subdivisions comprises setting the first subdivisions so that they are within 10%, preferably within 5% and most preferably within 0.8% of the second subdivision target value of that second subdivision, and wherein setting the second subdivisions comprises setting the second subdivisions so that they are within 10%, preferably within 5% and most preferably within 0.8% of the further subdivision target value of that further subdivision, and
wherein setting the further subdivisions comprises setting the further subdivisions so that they are within 10%, preferably within 5% and most preferably within 0.8% of the emissive display target value of the emissive display target value.

11. The method according to claim 3, wherein in determining any or more of the first subdivision target value, second subdivision target value, the further subdivision target value and/or emissive display target value, an environmental parameter is taken into account.

12. The method according to claim 11, wherein the environmental parameter is obtained by measuring a temperature of at least one emissive device, first subdivision, second subdivision or further subdivision.

13. The method according to claim 11, wherein taking into account the environmental parameter includes measuring an ambient temperature and estimating the temperature of at least one emissive device, first subdivision, second subdivision or further subdivision from the measured ambient temperature.

14. The method according to claim 11, wherein the environmental parameter is any or more of ambient illumination, ambient humidity.

15. The method according to claim 3, wherein in determining any or more of the first subdivision target value, second subdivision target value, further subdivision target value and/or emissive display target value, an operating parameter stored on the first subdivision or second subdivision or further subdivision is taken into account.

16. The method according to claim 15, wherein the operating parameter comprises any or more of age of the first subdivision or of the second subdivision or of the further subdivision, or total ON time of the first subdivision or of the second subdivision or of the further subdivision.

17. The method according to claim 1, wherein setting the emissive devices comprises retrieving and adjusting a control parameter.

18. The method according to claim 3, wherein setting the emissive devices, the first subdivisions, the second subdivisions and the further subdivisions comprises an adaptive calibration algorithm for calibrating the emissive devices, the first subdivisions, the second subdivisions and the further subdivisions.

19. (canceled).

20. The method according to claim 18, wherein said calibration comprises calibration of brightness and/or color.

21. (canceled).

22. (canceled)

23. Transmission of the computer program of claim 26 over a local or wide area telecommunications network.

24. A control unit for use with a tiled large-screen emissive display (100), said emissive

display (100) comprising a set of first subdivisions, each of said first subdivisions comprising a plurality of emissive devices, the control unit being adapted for controlling setting of the tiled large-screen emissive display (100), the control unit comprising:
means for setting the emissive devices of each first subdivision so that each first subdivision is optimized to a first subdivision target value for that first subdivision,
means for setting the first subdivisions of the emissive display (100) taking into account the first subdivision target value for each first subdivision,
wherein setting the emissive devices and setting the first subdivisions includes initial and periodic calibration
so that the emissive display (100) is optimized to an emissive display target value for that emissive display (100).

25. A control unit according to claim 24 for use with a tiled large-screen emissive display (100), said first subdivisions being grouped in a set of second subdivisions, the means for setting the first subdivisions comprising means for setting the first subdivisions of each of the second subdivisions, taking into account the first subdivision target value for each first subdivision, so that each second subdivision is optimized to a second subdivision target value for that second subdivision, means for setting the second subdivisions of the emissive display (100) taking into account the second subdivision target values for each of the second subdivisions, so that the emissive display (100) is optimized to an emissive display target value for that emissive display (100).

26. A computer readable medium storing a computer program comprising the steps of the method according to claim 1.

Evidence Appendix

None.

Related Proceedings Appendix

None.